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**ROLL NO:-SECOA115**

**ASSIGNMENT NO:-07**

**AIM** **:-** Write C++ program for storing binary number using doubly linked lists. Write functions- a) to compute 1‘s and 2‘s complement b) add two binary numbers.

**PROGRAM:-**

#include<iostream>

using namespace std;

struct node

{

bool b;

node \*next;

node \*prev;

};

class binary

{

node \*nn,\*head,\*cn,\*last;

public:

binary()

{

head=last=NULL;

}

void create();

void ones();

void twos();

void display();

void add(binary a,binary b);

};

void binary::create()

{

int a,i;

cout<<"\nEnter no. of bits in binary number=";

cin>>a;

for(i=0;i<a;i++)

{

nn=new node;

cout<<"Enter bit=";

cin>>nn->b;

nn->prev=NULL;

nn->next=NULL;

if(head==NULL)

{

head=nn;

}

else

{

cn=head;

while(cn->next!=NULL)

{

cn=cn->next;

}

cn->next=nn;

nn->prev=cn;

}

}

last=cn->next;

}

void binary::display()

{

cn=head;

cout<<"\nThe binary number = ";

while(cn!=NULL)

{

cout<<cn->b;

cn=cn->next;

}

cout<<endl;

}

void binary::ones()

{

cn=head;

while(cn!=NULL)

{

if(cn->b==0)

cn->b=1;

else

cn->b=0;

cn=cn->next;

}

}

void binary::twos()

{

cn=last;

while(cn!=NULL)

{

if(cn->b==1)

break;

else

cn=cn->prev;

}

cn=cn->prev;

while(cn!=NULL)

{

if(cn->b==0)

cn->b=1;

else

cn->b=0;

cn=cn->prev;

}

}

void binary::add(binary a1,binary a2)

{

int sum ,carry=0;

a1.cn=a1.last;

a2.cn=a2.last;

while(a1.cn!=NULL && a2.cn!=NULL)

{

nn=new node;

sum=(a1.cn->b+a2.cn->b+carry)%2;

carry=(a1.cn->b+a2.cn->b+carry)/2;

nn->b=sum;

nn->next=nn->prev=NULL;

if(head==NULL)

{

head=nn;

last=nn;

}

else

{

nn->next=head;

head->prev=nn;

head=nn;

}

a1.cn=a1.cn->prev;

a2.cn=a2.cn->prev;

}

while(a1.cn!=NULL)

{ sum=(a1.cn->b+carry)%2;

carry=(a1.cn->b+carry)/2;

nn=new node;

nn->b=sum;

nn->next=nn->prev=NULL;

if(head==NULL)

{

head=nn;

last=nn;

}

else

{

nn->next=head;

head->prev=nn;

head=nn;

}

a1.cn=a1.cn->prev;

}

while(a2.cn!=NULL)

{ sum=(a2.cn->b+carry)%2;

carry=(a2.cn->b+carry)/2;

nn=new node;

nn->b=sum;

nn->next=nn->prev=NULL;

if(head==NULL)

{

head=nn;

last=nn;

}

else

{

nn->next=head;

head->prev=nn;

head=nn;

}

a2.cn=a2.cn->prev;

}

if(carry==1)

{

nn=new node;

nn->b=carry;

nn->next=nn->prev=NULL;

if(head==NULL)

{

head=nn;

last=nn;

}

else

{

nn->next=head;

head->prev=nn;

head=nn;

}

carry =0;

}

}

int main()

{

binary obj1,obj2,obj3,obj4,obj5;

cout<<" BINARY OPERATIONS";

int v;

do

{

cout<<"\n\nMenu\n";

cout<<"\n1 : 1's complement of binary number";

cout<<"\n2 : 2's complement of binary number";

cout<<"\n3 : Add 2 binary numbers";

cout<<"\n4 : Exit\n";

cin>>v;

switch(v)

{

case 1 : obj1.create();

obj1.display();

obj1.ones();

cout<<"\n\nAfter 1's complement ";

obj1.display();

break;

case 2 : obj2.create();

obj2.display();

obj2.twos();

cout<<"\n\nAfter 2's complement ";

obj2.display();

break;

case 3 : cout<<"\nFor first binary number";

obj3.create();

obj3.display();

cout<<"\nFor second binary number";

obj4.create();

obj4.display();

obj5.add(obj3,obj4);

cout<<"\n\nAfter addition";

obj5.display();

break;

case 4 : cout<<"\nExitted!";

break;

default : cout<<"\nInvalid option!";

}

}while(v!=4);

return 0;

}

**OUTPUT**

BINARY OPERATIONS

Menu

1 : 1's complement of binary number

2 : 2's complement of binary number

3 : Add 2 binary numbers

4 : Exit

1

Enter no. of bits in binary number=4

Enter bit=1

Enter bit=0

Enter bit=1

Enter bit=1

The binary number = 1011

After 1's complement

The binary number = 0100

Menu

1 : 1's complement of binary number

2 : 2's complement of binary number

3 : Add 2 binary numbers

4 : Exit

2

Enter no. of bits in binary number=4

Enter bit=1

Enter bit=0

Enter bit=1

Enter bit=1

The binary number = 1011

After 2's complement

The binary number = 0101

Menu

1 : 1's complement of binary number

2 : 2's complement of binary number

3 : Add 2 binary numbers

4 : Exit

3

For first binary number

Enter no. of bits in binary number=3

Enter bit=1

Enter bit=1

Enter bit=1

The binary number = 111

For second binary number

Enter no. of bits in binary number=2

Enter bit=1

Enter bit=0

The binary number = 10

After addition

The binary number = 1001

Menu

1 : 1's complement of binary number

2 : 2's complement of binary number

3 : Add 2 binary numbers

4 : Exit

4

Exitted!